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ASSOCIATION OF ANEMIA AND BLOOD GROUP AMONG VEGETARIAN AND NON-VEGETARIAN STUDENTS OF UNIVERSITY CAMPUS, RAJARSHI JANAK UNIVERSITY, JANAKPURDHAM, NEPAL

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ABSTRACT

Introduction: *Anemia is the major health problem among the young adults. Its prevalence increases among young adults whose diet doesn't contain non-vegetarian food is at high risk of getting anemic. Vegetarians are more vulnerable to be anemic whose diet doesn't contain vit-B12, folic acid and iron supplements. .The prevalence of anemia among students will help identify association between blood groups and vegetarian/non-vegetarian diet in the university campus, Rajarshi Janak University, Janakpurdham.*

Materials and methods: *It was a cross-sectional study conducted at the University Campus, Rajarshi Janak University, Nepal Janakpurdham, Nepal. The measurement of Hemoglobin (Hb) was done by Cyanmethemoglobin method Recommended by ICSH and the blood group ABO with RH system was performed by slide agglutination method.*

Results: *Out of 130 students 51(39.24%) were the prevalence of anemia among young adults. Status of anemia by blood group (n=130) shows that the Blood Group AB has the highest prevalence of anemia, followed by Blood Group O, followed by Blood Group A, and least in B. The association between anemia and blood group was found significant (p=0.050). Among non-vegetarian students38.4% were anemic whereas 60% of vegetarian students were anemic. The association between dietary habits and the anemia was found insignificant (p=0.332).*

Conclusion: *According to this study, it can be concluded that the anemia was more common among female students, it may a reason for concern because the cause could be due to poor dietary habits or a reduction in food facilities.*

Keywords: *Anemia, Blood Group, BMI, Non Vegetarian, Vegetarian*

INTRODUCTION

Anemia is a worldwide public health issue that has a significant impact on social and economic development as well as human health in both developed and developing nations.[1] The World Health Organization (WHO) defines anemia as hemoglobin levels below 13 g/dl in men and less than 12 g/dl in non-pregnant women. Anemia affects 1.62 billion people globally, or roughly 24.8% of the population, and is believed to be the cause of 20% of maternal and perinatal deaths in developing nations.[2] Adolescent anemia negatively impacts mental and physical development, hinders behavioral and cognitive development, lowers physical fitness, inhibits work performance, and even increases the risk of an unfavorable pregnancy outcome. Because anemia reduces cellular oxidative capability and oxygen transport, it can potentially impair athletic performance.[3] Each person's identity is determined by their blood type and group, which are determined by the specialized connective tissue known as blood. The blood group is clinically significant in trans-

fusion medicine. One of the major health problems facing the globe today is malnutrition, of which anemia is a major contributing factor, especially in developing countries. Anemia is a disorder where the blood's ability to carry oxygen is reduced, either because there are fewer red blood cells or because there is less hemoglobin in the blood.[2] An inherited blood characteristic is the ABO blood group. The oligosaccharide head groups of the glycosphingolipids contribute to the determination of the ABO blood groups, which are distinguished by the presence of different blood group antigens on the membrane of human red blood cells. The only difference between A and B antigens, which are the most significant, is in their terminal sugar moieties. N-acetyl galactosamine is the terminal sugar unit of an antigen, while galactose is the terminal sugar unit in a B antigen**.** The four main blood groups-A, B, AB, and O-are separated based on the presence of these antigens and agglutinins. Agglutinins are the antibodies that are produced against these red cell antigens. Human red blood cells that contain antigen D are referred to as Rhesus antigen D positive, whilst those that do not are referred to as Rhesus antigen D negative.[4] The International Society of Blood Transfusion recognizes 33 blood types. A, B, AB, and O are the main blood types, and they can be either Rh positive or negative. By coding for particular antigens on the surface of the red cell membrane, these blood types of individuals are genetically determined. Numerous studies have documented the link between ABO blood types and the etiology of diseases**,** Individual differences also exist in blood hemoglobin levels. Age, sex, race, occupation, socioeconomic level, and a number of medical issues are the causes of these differences. Compared to age-matched men, women's hemoglobin levels are 12% lower. Hemoglobin concentration genetic differences can also be caused by genes encoding RBC enzymes and membranes.[5] Diet has been important for health since Hippocrates, who famously said, "Let food be thy medicine and medicine be thy food." The "ideal" diet has changed over the past few decades from one that puts one at low risk of nutritional deficiencies to one that guards against diseases brought on by or made worse by overeating. In order to prevent anemia, pupils should eat a balanced diet.[6] Anemia is the major health problem among the young adults. Its prevalence increases among young adults whose diet doesn't contain non-vegetarian food is at high risk of getting anemic. Vegetarians are more vulnerable to be anemic whose diet doesn't contain vit-B12, folic acid and iron supplements. Under this situation it is far better to take the preventive measure to combat anemia by taking iron or vitamin rich diet, especially to those who are more prone to anemia.[7]

MATERIALS AND METHODS

A cross-sectional study was done at University Campus of Rajarshi Janak University (RJU), Janakpurdham, Nepal. The study encompassed the entire student, which consisted of 740 enrolled students. The research was conducted at the University Campus of Rajarshi Janak University in Janakpurdham, where the diverse student population from different geographical regions of Nepal, studying in multiple academic streams like Bachelor of Science in Medical Laboratory Technology (B.Sc. MLT), Bachelor of Science in Computer Science and Information Technology (B.Sc. CSIT), and Bachelor of Computer Application (BCA), Bachelor of Business Administration (BBA), and Bachelor of Arts and Legislative Law (BALLB), and Bachelor in Public Health (BPH).

Inclusion criteria: Healthy young adults between the age group of 18-30 years. Exclusion Criteria**:** Students with comorbidity and other chronic illness, known hemoglobinopathies and worm infestations were excluded from the study.

Data collection: Structured questionnaire were distributed to the participant to fill up. Weight of the students was measure with weighing machine. Measuring tape was used to measure the height of the students. Height were drawn on wall and students were advised to stand, so the investigator would measure height in meter.

Sample size: There were 740 students studying in different stream at RJU. However, only 130 students consented and provided blood samples and related information. Therefore sample considered for this study 130.

Laboratory Methods: The ethylene diamine tetra acetic acid (EDTA) mixed blood was considered to determine the hemoglobin concentration (g/dL) by the Drabkin's Cy-

anmethemoglobin method (Cook, 1985). The criteria for detecting anemia were diagnosed as per WHO guidelines (WHO, 2001).

The ABO blood group and Rhesus (Rh) factor of the anemic subjects were determined using the Tile or Slide testing method (Khattak et al., 2008) with the help of antisera-A, antisera-B and antisera-D and finally, the frequency of occurrence of anemia in relation to ABO blood group and Rh factor was assessed.

Ethical Approval: Procedures and questionnaire for this study has been reviewed and approved by IRC Institutional Review Committee (IRC) of Janki Medical College, Janakpurdham (Ref. 014/IRC-JMC/2024/008). All participants were informed of the purpose and procedure of the study prior to the survey. All participants completed the informed consent form before the survey.

Statistical Analysis: Raw data were coded and analyzed using SPSS. Frequency distributions, cross-tabulations, and Chi square tests were used to assess associations between variables, with a significance threshold of $p < 0.05$.

RESULTS

Among the number of participants 70.76% were between age 20-25 years, followed by 27.69% were less than 20 years, and 1.53% were above 25 years. The average age of students were 21 years.

Table 1: Age distribution of participants (n=130)

Age (in years)	Number	Percent
<20	36	27.69
20-25	92	70.76
>25	2	1.53
Total	130	100

Table 2. Gender distribution of participants (n=130)

Sex	Number	Percent (%)
Male	71	54.61
Female	59	45.39
Total	130	100%

Out of 130 participants, majority (42%) of students were in BBA, followed by 30% in BALLB, 13.5% were in B.Sc. CSIT, 10% were in BCA, 3% were in B.Sc.MLT and 1.5% were in BPH.

Out of 130 participants (45.4%) were first year students, followed by 27.7% were in second year, 22.3% were in third year students and 4.6% were in 4th year students. 96.15% were Non-Vegeterian and 3.85% were vegetarian.

Table 3: Distribution of participants by blood group (130)

Blood group	Number	Percent (%)
A	33	25.38
AB	12	9.23
B	50	38.46
O	35	26.29
Total	**130**	**100%**

Out of 130 participants, maximum number of participants 96.15% were Rh positive and less number of participants, 3.85% were Rh negative. The maximum number of participants, 60.76% had normal hemoglobin and about 39.24% were anemic.

Table 4: Nutritional status of Participants by BMI (n=130).

Out of 130 participants, 50% were healthy body weight, followed by 39.23% were underweight, 6.92% were overweight and 3.84% were obese.

BMI	Weight status	Number	Percent (%)
Below 18.5	Underweight	51	39.23
18.5-24.9	Healthy weight	65	50.00
25.0-29.9	Overweight	9	6.92
30.0 and above	Obesity	5	3.84
Total		**130**	**100**

Table 5: Status of anemia by blood group (n=130)

Blood grouping	Anemic		Normal		Total (n=130)	
	Number	Percent	Number	Percent	Number	Percent
A	12	36.36	21	63.64	33	100
AB	8	66.67	4	33.33	12	100
B	14	28	36	72	50	100
O	17	48.57	18	51.43	35	100
Chi-square =7.829; df = 3; p = 0.050 ; significant						

Table 6: Status of anemia by dietary habits (n=130)

Among the participants, non-vegetarian students 38.4% were anemic whereas 60% of vegetarian students were anemic. The association between dietary habits and the anemia was found insignificant (p=0.332).

Dietary pattern	Anemic (n= 51)		Normal (n= 79)		Total (n=130)	
	Number	Percent	Number	Percent	Number	Percent
Non- vegetarian	48	38.4	77	61.6	125	100
Vegetarian	3	60.0	2	40.0	5	100
Chi-square = 0.941; df=1; p= 0.332; insignificant						

Table 7: Status of anemia by gender (n=130)

Among the participants, male participant's students (23.72)% were anemic whereas (52.11)% of female participant's students were anemic. The association between anemia and gender is significant among female participants.

Gender	Anemic		Normal		Total (n=130)	
	Number	Percent	Number	Percent	Number	Percent
Male	14	23.72	45	76.28	59	100
Female	37	52.12	34	47.88	71	100
Chi-square = 10.889; df=1; p= <0.001 ; significant						

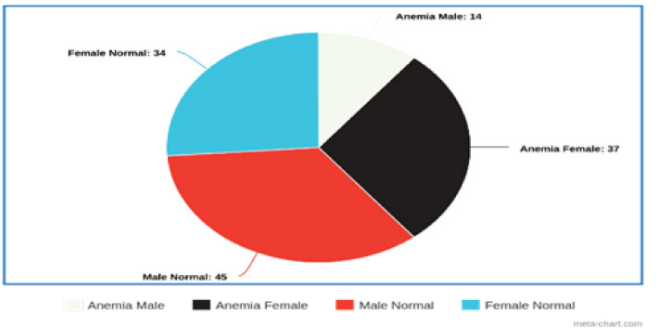

Figure 1: Status of Anemia by Gender

Table 8: Status of anemia by age (n=130)

Age	Anemic		Normal		Total (n=130)	
	Number	Percent	Number	Percent	Number	Percent
<20	17	47.23	19	52.77	36	100
20-25	33	35.87	59	64.13	92	100
>25	01	50.00	01	50.00	2	100
Chi-square =1.334; df=1; p=0.248 insignificant						

Among the participants, <20 age groups (47.22) % were anemic and between 20-25 age were (35.86) % were anemic. The association of anemia and age was insignificant with p = 0.248.

Table 9: Status of anemia by body mass index

Nutritional status	BMI	Anemic (n=51)		Normal (n=79)		Total (n=130)	
		Number	Percent	Number	Percent	Number	Percent
Underweight	Below 18.5	19	37.26	32	62.74	51	100
Normal	18.5-24.9	29	44.62	36	55.38	65	100
Overweight	25.0-29.9	1	11.11	8	6.15	9	100
Obese	30.0 above	2	40.00	3	60.00	5	100
Chi-square=2.735; df=2; p = 0.254 insignificant							

Status of anemia by body mass index (n=130). The table shows that association of anemia and BMI was insignificant with p=0.254.

DISCUSSION

In our study, students with hemoglobin concentration less than 13 g/dl were taken as anemic in male and less than 12 g/dl in female. Total 51 students are anemic, while remaining 79 students are non-anemic. 71 students are females out of which 37 are anemic whereas 59 students are males where only 14 males were found to be anemic. Out of 130 students, 48 students with hemoglobin less than 12 g/dl were Rh positive and 3 students Rh negative whereas 77 students and 2 students were Rh positive and Rh negative respectively with Hemoglobin more than 12 g/dl. Also 33 students are blood group A, 12 with blood group AB, 50 with blood group B and O blood group students are 35. Among the A blood group, 12 students were anemic, among blood group B, 14 were anemic, among blood group AB, 8 were anemic and 17 students with O blood group were anemic. In our study, the distribution of blood group B was the highest (38.46%), followed by blood group O and A with a percentage frequency of 26.29% and 25.38%, respectively and the least percentage frequency is that of blood group AB which is 9.23%. The higher prevalence of anemia in our study was found in blood group B, followed by O, A and then AB. The frequency of Rh + ve was about 96.15%, while 3.85% were Rh-ve in our study.

Similar patterns of distribution were also observed in other studies. Thus, the frequencies of ABO and rhesus blood groups vary from one population to another. When the distribution was further examined, blood group B had the largest percentage frequency (68%), followed by blood groups O and A (63 and 45%, respectively), and blood group AB (22%), which had the lowest ratio. Blood group B had the highest prevalence of anemia, followed by O, AB, and A. A study by Kaur M. found and documented the same pattern of blood group prevalence (B>O>A>AB). Blood type O has been identified as the most prevalent blood group in numerous other research.[7] Anemia and blood group are strongly correlated, according to additional research. While those without blood group antigens alpha and beta are resistant to anemia, those with these antigens are relatively more likely to be anemic. Therefore, it can be said that people with blood kinds A, B, and AB can avoid anemia by regularly consuming a diet high in iron and vitamins.[8] It will be simpler to create interventions that are more effective and integrative in addressing several contributing elements at once if one is aware of how these components differ by geography, degree of development, and other social and economic aspects.[9]

The participants in this study were 227 healthy students. The students' median age was 19.8 years, and 59.9% of them were male. The age difference between male and female students was nonexistent. According to ABO blood group typing, the majority of health students (38, or 47.58%) had blood group O, followed by B blood groups (22, or 27.75%), A blood groups (18.06%), and AB blood types (15, or 6.6%). Blood group A was most prevalent among Nepalese students in a study, followed by blood groups O, B, and AB. The blood groups seen in the study were B > O > A > AB, in decreasing order.

The most common subgroup with low Hb levels (13.2%) is the B blood group. Blood group AB (46.15%) was the most prevalent when it comes to the distribution of people by blood types and their correlation with anemia. There was no significant correlation between anemia and any blood group in the study, and the anemia discovered with decreasing prevalence was AB > B > O > A. Due to a decrease in red blood cell mass brought on by elevated estrogen levels, females were more likely than males to suffer from anemia. We can counsel those who are more vulnerable to anemia to consume a diet rich in iron and vitamins, as well as their supplements, based on their blood types. Future research should be done on a larger population to corroborate the findings and to determine what sort of anemia each blood group is prone to.[2] Anemia affects over 24.8% of people worldwide, with preschool-aged children having the highest prevalence (47.4%) and men having the lowest (12.7%). According to WHO regional estimates, South East Asia has the largest number of people afflicted with nutritional anemia, while Africa has the largest percentage of the population (47.5% –67.6%).[10] This study reveals that there is a relationship between blood group and anemia, though not statistically significant which could be due to small sample size Status of anemia by gender (n=130).Similar finding was found in our study where girls are more prone to anemia. The individuals with blood group antigen AB and

O are comparatively more prone to be anemia, whereas the individuals devoid of these antigens are resistant to anemia. So, the regular intake of iron and vitamin rich diet in individuals having blood groups AB, and O can prevent the occurrence of anemia. The status of anemia by dietary habits shows that among non-vegetarian study 38.4% were anemic whereas 60% of vegetarian students were anemic. The association between dietary habits and the anemia is insignificant (p=0.332).

CONCLUSION

More than one third students were found anemic. Females were more prone to be anemic as compared to male. Further, two third of the students with blood group B found to be anemic followed by blood group O, A and AB. Among the number of participants 70.76% were between age 20-25 years, followed by 27.69% were less than 20 years, and 1.53% were above 25 years. The average age of students were 21 years. Among the participants 50% were healthy body weight, followed by 39.23% were underweight, 6.92% were overweight and 3.84% were obese. Association of gender and blood group with anemia was found to be significant. However, no significant of anemia was found with vegetarian and non-vegetarian diet.

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CONFLICT OF INTEREST

This article possesses no any conflict of interest.

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